OBSERVATIONS ON THE GREAT LAKES.

REPORTS FROM VESSELS.

The Lake Marine Section of the Forecast Division has received reports for December from the captains of 2 vessels navigating the Great Lakes during the first few days of the month after which they went into winter quarters. Navigation had generally closed by December 15.

REPORTS FROM U. S. LIFE-SAVING STATIONS.

Through the co-operation of the General Superintendent of the Life-Saving Service and the Secretary of the Treasury, the Weather Bureau has received 106 weekly transcripts of journals for the month of December from the keepers of 36 U. S. Life-Saving stations on the Great Lakes. Many of these stations "went out of commission" for the winter during this month. The following special notes by the respective keepers are extracted from these journals:

Middle Island, Lake Huron.—Donald McKenzie, keeper. December 16, the storm-signal displays and telephone service furnished this station by the Weather Bureau have been of great value to shipmasters and owners during the short period elapsed since this most important service has been established; they have been highly appreciated and will be more so hereafter. This station is on the track of all commerce between the lower and upper lakes; the vessels pass close to these islands and attention is given to the signals. The telephone has been useful in the cases of six casualties occurring here, besides giving much information as to weather and telegrams. The number of craft of all kinds passing here from April to December 15 was 21,030 steam and sail vessels, besides many that can not be seen owing to thick weather, making an average daily for eight and one-half months of about 82, not including log rafts. Over 300 craft have been sheltered during storms in this vicinity. The coast above and below these islands is too much exposed for about 100 miles each way to allow of any safe harbors, and the important services rendered here by the Weather Bureau are much sought after and of great importance to sailors.

Sturgeon Point, Lake Huron.—J. E. Henderson, keeper. December 9, more ice in sight than I have seen at this date since 1885.

SURFACE CURRENTS AND FOG ON THE LAKES.

Owing to the close of navigation there have been no special reports of fogs. The general report on the currents has been prepared by the Chief of the Weather Bureau and will soon be published.

NOTES BY THE EDITOR.

THE NORTHERS OF TAMPICO AND VERA CRUZ.

The relation of the hurricanes of the West Indies to the northers of the Mexican coast was partially elucidated by W. C. Redfield in a memoir published in successive numbers of the American Journal of Science for 1844 (second series, Vol. 1). Having found that the norther of October 2, 3, and 4, 1837, at Matamoras, was simply the western side of a West Indian hurricane about to recurve in its path, and having found that the paths of other hurricanes were apparently affected by the high barometric pressure on the northwestern side, causing them to move east-northeast rather than northeast or north-northeast, he framed a hypothesis that all Mexican and Texas northers were connected with hurricanes. In his memoir he therefore traces with care the tracks of the centers of revolving storms beginning respectively: 1842, October 2, in the Gulf of Campeche; 1844, October 4, in the Gulf of Honduras; 1837, September 26, on the northern coast of Venezuela. He classes all of these as storms that had moved into the Caribbean Sea and Gulf of Mexico from some distant point, and considers the northers that prevailed in the western portion of the Gulf as due to the western half of these revolving storms. On the other hand, the study of the U. S. Weather Maps showed, even in 1871, that a norther flowing over Texas and the western portion of the Gulf of Mexico was not always preceded by a hurricane to the southward, although it was generally preceded by a barometric depression of several tenths of an inch, and its flow into the Bay of Campeche frequently determined the formation of a whirl that, moving northeastward, might rapidly develop into a hurricane. All the observations given by Redfield in connection with his storms of October 2, 1842, and October 4, 1844, are consistent with their origin in this manner, and the storms of October 1 and October 21, 1893 (see low areas III and XV of that month), apparently belong to that same class. Redfield's hurricane of 1842, August 30 to September 9, pursued a track that kept remarkably close to the parallel of N. 23°, and is believed by him to have passed from the Atlantic to the coast of Durango, Mexico, where the reports from stations show that a violent north wind, followed by a calm and then a furious south wind, advanced westward to about 60 miles from the coast, after which it reached the table-land and was heard from no more. If this storm on the lowlands of Mexico was really the continuation of the hurricane experienced a few days before in the Bahamas, it adds one more to the list of whirlwinds broken up by impinging upon the land, but does not diminish the number of cases in which cool and dry northerly winds blowing from the land upon the warm water of the Gulf of Mexico or the Atlantic ocean have contributed to the formation of a new whirlwind.

A norther prevailed at Vera Cruz from September 29 to October 2, 1842; its maximum force was at midnight September 30. Redfield states that the hurricane of which he considers this to have been the western quadrant must therefore have been moving very slowly at that time; that this protracted duration is not unfrequent, but rather common in the northers at Vera Cruz; that this may be ascribed with probability to the cessation of the westerly progression of the storm and the gradual commencement of an easterly course. This explanation by Redfield implies that a hurricane had moved west or west-northwest through Honduras, Yucatan, and Mexico and turned to a northeastward course about October 2 in the Bay of Campeche. A transference of a revolving system of hurricane winds across or over the mountains of Central America is, however, difficult to believe until conclusive proof is offered, and especially in view of the fact that while this is supposed to be going on the volcanic smoke and the upper clouds of these regions continue to flow from west-southwest undisturbed.

The maps of International Simultaneous Observations indicate quite clearly that when a norther prevails in the Gulf of Mexico or the Caribbean Sea there exists a wide-spread barometric depression on the Pacific coast of Mexico or in the northern portion of South America, respectively, but not necessarily any hurricane, properly so-called. The flow of cold air determines the formation of a hurricane center somewhere within this general depression if all conditions are favorable. In a similar way, a general depression in the Indian Ocean is followed by an inflow of cooler or drier air and the formation of a typhoon center somewhere within the general depression. So, also, the typhoons of the China Sea are sometimes determined by the flow southward of air from the interior of Asia.

The norther that began September 29, 1842, at Vera Cruz and was at its maximum by midnight had moderated materially by October 3, but the wind continued northwest until October 4. On the 29th the Mexican brig "Secunda Fama" sailed from Vera Cruz and on October 2 was inside of the bar at Tampico; during the whole of this interval she seems to have had no experience of the norther, but on the latter date was suddenly attacked by it and driven on the reef of Lobos Island, about 45 miles south of Tampico. The schooner Caroline when about 100 miles east of Matamoras on October 1 ran into the gale which was blowing from the northeast then and there, but as she sailed eastward through it the wind became northerly in the central portions and northwest as she passed eastward from the center, so that she was driven near to the Campeche bank.

These and other reports gathered by Redfield are consistent with a rather different explanation of the nature of this and other northers on the Gulf, and one that I have often advocated. We have here a mass of cool, dry air flowing from Texas nearly due south or south-southeast and steadily reinforced by fresh supplies from the northward. In the central axis of this stream the current preserves a nearly uniform movement forward, but both in front and on either side the air has to push opposing air away, and there is, therefore, a steady outflow so that on the easterly side of the axis northwesterly winds are found, while on the western side northeasterly occur, and these may curve around even to westerly and easterly, respectively. The winds on the western side of the axis are moving in the wrong direction to form a permanent cyclonic whirl, they are pushing toward the Mexican coast and piling up clouds and possibly forming local small whirls before they reach the table-lands, so that an observer on the table-lands, looking northeastward, sees the ocean of clouds below him long before he feels the northeasterly wind, even if it comes at all; it thus happens that Tampico and Matamoras experience these winds several days later than Vera Cruz. On the eastern side of the axis the deflection of the wind conspires with the rotation of the earth to the formation of hurricanes, which subsequently move northeastward over the Gulf of Mexico with rapidly increasing velocity.

Vessels that keep near the Mexican coast avoid the severity of the gale that prevails 50 miles away to the eastward, but they experience short-lived whirls and squalls; for instance, Redfield quotes from the record of H. M. S. "Thunderer," in December, 1840, at Vera Cruz; just before the norther commences the scud can be seen overhead progressing rapidly from southeast to northwest, which shows that the northerly wind is rising and flowing back on itself toward the northwest. The most certain forerunner of the norther was, in those days, well known to be a barometric fall of from 0.2 to 0.4, which is followed in a short time by northerly winds at Vera Cruz. The northers of the month of May to August in Mexico are a different type of storm; they are known as the "northers of Muerto Colorado," and begin at northeast and settle at north-northwest. During these months the southwest hurricanes blow on the Pacific coast of Mexico, and, like the "Muertos," are due to the area of low pressure that then prevails from Arizona southward and southwestward. When this area of low pressure disappears in the winter months, the west coast of Mexico experiences the violent local storms known